GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: 3/7/80 - REVISED

Project Title: Improving the Performance Effectiveness of Groups

Project No: M-50-636

Project Director: Dr. David M. Herold

Sponsor: Army Defense Supply Service - Washington

Agreement Period: From February 27, 1980 Until February 26, 1981

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Sponsor Contact Person (s):

Technical Matters

Contractual Matters
(thru OCA)

Mrs. Dorthy Finley/PERI-IJ
ARI Field Unit
P. O. Box 2086
Ft. Benning, GA 31905

(404) 545-5589 or 4513

Defense Priority Rating: DO-S-1 under DMS Reg. 1

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SPONSORED PROJECT TERMINATION

B-440

Date: 7/28/81

Project Title: Improving the Performance Effectiveness of Groups

Project No: M-50-636

Project Director: Dr. David M. Herold

Sponsor: Army Defense Supply Service - Washington

Effective Termination Date: 2/26/81

Clearance of Accounting Charges: 2/26/81

Grant/Contract Closeout Actions Remaining:

- x Final Invoice and Closing Documents
- _ Final Fiscal Report
- x Final Report of Inventions
- _ Govt. Property Inventory & Related Certificate
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- _ Other _____

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and which they have classified according to the theoretical framework presented to them. The four groups reported on seven tasks. Brief descriptions of these tasks and their classification are presented below as Figure 1.

Social \ Technical	Simple	Complex
Complex	2. Allocating reserved parking spaces. 4. Moving steno pool to new location. 6. Finding remedy for coffee-break abuse.	1. Changing company's name and/or logo. 5. Changing formula for computing agents' compensation 7. Deciding on the suspension of sale of "debit" or "industrial" insurance.
Simple	3. Filing with state for approval of new policy.	

Figure 1. Group tasks and their classification as generated by groups of insurance company managers.

Next, these seven brief task descriptors were presented to 27 other insurance company managers (from different companies) along with brief training in the use of the typology. Each of the 27 managers was asked to classify each of the seven tasks. Table 1 below shows these classifications. Five of the seven tasks show extremely high interrater reliability, with two tasks (moving the steno pool and filing with the state for new insurance products) being classified across two adjoining cells. For these two tasks all participants agreed on the diagnosis as to one of the typology dimensions, but there was considerable disagreement as to classification on the second typology dimension. Debriefing of participants revealed that in the case of the state filing task, non-task variables such as the complexity of regulations in the participants' state influenced the degree of technical complexity which individuals perceived to be associated with the task. In the case of the steno pool relocation, the task descriptor seemed too brief and thus allowed participants to view it in essentially two different ways: one in which social issues were non-trivial but the technical aspects of a move were straight-forward, and one in which the social issues were non-trivial but the technical dilemmas created by relocation were also non-trivial.

Task # (from Figure 1)	Soc. Complex-Tech Simple	Soc. Complex-Tech Complex	Soc. Simple-Tech Simple	Soc. Simple-Tech Complex	Total
1	1	24	-	2	27
2	26	1	-	-	27
3	-	-	11	16	27
4	18	7	2	-	27
5	1	25	-	1	27
6	21	4	2	-	27
7	1	25	-	1	27

Table 1. Frequencies with which tasks in Figure 1 were classified into the cells in the typology by a second group of insurance-company managers.

This exercise was useful in that it revealed that for many tasks in actual organizational settings individuals could be trained to use the theoretical framework to classify tasks by the potential social and technical difficulties which they present to the group, and that such classifications are quite reliable, i.e., tasks can be analyzed independently of other personal or contextual influences. In the case of the two tasks where this was not the case, new insight was gained as to the types of contextual variables which may influence the classification of a given task in our typology. This information is directly relevant to the other objective of this project, namely, identifying organizational factors which may influence a task's classification and/or the group's performance on the particular task.

Finally, the project director made two presentations in connection with this project. One presentation was made to the ARI Field Unit at Ft. Benning, Georgia, and the other was part of a conference entitled, "Colloquium on Selected Topics in Behavioral Science Research", which was held at ARI headquarters in Alexandria, Virginia, April 23-25, 1980.

Major Problems Encountered

As of this date, no major problems have been encountered which would interfere with the progress of this project.

Amount of Funds Expended

An unofficial estimate of funds expended to date shows that approximately $3677.00 in personal services (excluding associated overhead), $52.75 in travel, and approximately $25.00 in materials and supplies have been spent. The project director estimates that the remaining funds are sufficient for the completion of the proposed research.

M-50-636

ARI Contract No. MDA903-80-C-0158
Research Project M-50-636
Georgia Institute of Technology
David M. Herold, Project Director
2nd Quarterly Report
August 27, 1980

Project Title

Improving the Performance Effectiveness of Groups

Major Accomplishments

Based on the successful categorization of a limited set of tasks reported as part of last quarter's activities, this quarter's empirical activity focused on testing the task typology using an enlarged task-set and using essentially the same procedures. There were three purposes for doing this: a) to more fully test two cells in the task typology which were inadequately represented by the seven tasks used in the first test, b) to see whether managers could identify social and technical complexities inherent in a broad sampling of organizational tasks, and c) to gain additional insights into the non-task factors (i.e., membership or contextual) which would cause some individuals to perceive the same brief task descriptors as more or less socially or technically complex than others.

Using group tasks suggested by the previous sample of 27 insurance company managers, as well as some tasks identified by the investigator based on informal discussions with others and his knowledge of the industry, 12 new tasks were presented to a new sample of 30 managers for categorization. As before, these managers were briefly trained in the use of the task typology and in the task attributes which may be useful in determining the technical and/or social complexity inherent in a given task. Table 1 provides the description of each task and the frequency with which it was categorized in

each of the typology cells by the 30 managers.

As was the case in the last task-classification pilot, most of the tasks (8 of 12) showed very good interrater agreement, with an average of 81% of the managers agreeing on the diagnosis of these eight tasks. The remaining four tasks were again split between two adjoining cells, indicating wide agreement as to the classification of the tasks on one of the two dimensions but disagreement as to classification on the other dimension. For task number 3, filing corporate tax returns, we find 90% of the managers (27 out of 30) agreeing that the task is socially simple, however, these people were split 27% and 63% as to whether the task was technically simple or complex. Debriefing showed that those rating the task as technically simple were largely unfamiliar with the details of this task in organizations and failed to realize the aspects of the task which in reality may make it quite technically complex.

For the other 3 cross-classified tasks we find agreement that they are socially complex, however, different managers read a different degree of technical complexity into them. Downward job-level changes, development of new experimental work schedules, and modifying an employee fringe benefit were all seen as creating social complexities. The issue arose, however, whether they also presented technical complexities. Again, debriefing of the managers provided some insight as to situational parameters which they assumed or read into the brief task descriptor so as to arrive at their technical complexity judgment. These insights will be useful in future phases of this project when it will be necessary to distinguish between social and technical process difficulties inherent in the task versus those created by factors above and beyond the objective task (such as the nature

of the context in which the task is being performed).

This pilot was useful in several respects. First it expanded our demonstration that individuals can be briefly trained in recognizing social and technical dilemmas inherent in tasks which they and their work groups confront. Second, it again showed that for a large percentage of organizational tasks (approximately 70%) the perceptions of these dilemmas remain constant across organizational contexts or situations, as evidenced by the agreement on their classification on the part of individuals coming from different companies and different departments within these companies. Third, it raised some questions as to whether some tasks can be classified without additional information and whether such additional information, if necessary, would constitute task information or context information. Given the very brief descriptors presented in these pilots, this question will need additional attention in the future. Finally, the debriefing of participants was useful in calling attention to situational differences which could affect the ultimate technical and/or social complexity confronting the work group.

Other activities this quarter consisted of beginning two literature searches to be used in developing other aspects of this project. One search is focused on the last five years of the social psychological literature on group performance, with particular attention to the tasks used to test performance hypotheses. The other search focuses on the intervention literature, again with particular attention to successful and unsuccessful attempts at performance-improving interventions and the group tasks for which they did or did not work.

Major Problems Encountered

No major problems have been encountered which would interfere with the

progress of this project.

Amount of Funds Expended

An unofficial estimate of funds expended to date shows that approximately $9559 was spent on salaries and wages (excluding associated overhead), $525.59 was spent on travel, and approximately $60 on materials and supplies. The project director estimates that the remaining funds are sufficient for the completion of the first year activities.

Task	Socially Complex-Technically Simple	Socially Complex-Technically Complex	Socially Simple-Technically Simple	Socially Simple Technically Complex	Total
1. Generating or modifying a vacation plan.	24	5	1	-	30
2. Designing new agent's contract.	3	24	1	2	30
3. Filing corporate tax returns.	-	3	8	19	30
4. New product development (including marketing, actuarial, and legal work).	-	26	-	4	30
5. Developing a work measurement system.	3	24	2	1	30
6. Planning for the disposal of old equipment.	2	2	26	-	30
7. Choosing a "software" package.	3	24	1	2	30
8. Enacting downward job-level changes based on a job reevaluation.	16	14	-	-	30
9. Developing a variable work-hours plan.	10	19	-	1	30
10. Choosing who goes to a LOMA seminar.	23	3	4	-	30
11. Deciding on changes in the mortgage loan discount policy for employees.	14	10	5	1	30
12. Establishing reserve rates.	-	4	4	22	30

Table 1. Task descriptors and their categorization by insurance company managers. Dominant cell or cells are underlined to show relative presence or absence of cross-classifications.

M-50-636

ARI Contract No. MDA903-80-C-0158
Research Project M-50-636
Georgia Institute of Technology
David M. Herold, Project Director
3rd. Quarterly Report

November 27, 1980

Project Title

Improving the Performance Effectiveness of Groups

Major Accomplishments

Based on the previously reported experience with the categorization of tasks using the task typology, this quarter's empirical efforts were aimed at the refinement and expansion of these efforts so as to produce a useful task diagnostic process which could be easily communicated to individuals, and, which in turn, these individuals could use in diagnosing tasks.

Specifically, the following steps were taken: a) the task inventory was expanded from 12 to 20 tasks based on additional tasks generated by the last group of insurance-company managers used in this research; b) the training procedure was elaborated to include major attributes and sub-attributes which could be used for making task diagnoses; c) the major task attributes were used to develop decision-trees to aid subjects in determining whether social and/or technical task complexities are likely to exist in a given task; d) 33 middle-managers from different insurance companies were trained in

the theoretical meaning of the task typology, its use, and in the task attributes and sub-attributes which may be useful in diagnosing tasks; e) these 33 managers were then asked to use the decision-trees to diagnose the 20 tasks; f) managers were asked to break up into groups of 5 and 6, to discuss participants' reasoning behind their individual diagnoses, and to indicate individual changes in particular task diagnoses as a result of the group discussion; and g) groups were debriefed to gain insight into factors contributing to differential diagnoses of the same task. Since these data were just collected, the results will be included in the Draft Technical Report currently under preparation.

Another major effort this quarter consisted of beginning the preparation of the Draft Technical Report. This report will provide theoretical background to the task analysis approach used in the present research. It will describe the efforts aimed at producing the task typology, the efforts aimed at operationalizing this typology, training people in its use, the utility of such training, and the implications of such training for applied settings.

Finally, preparation of the second major Draft Technical Report of this project also began this quarter. This report goes beyond the task diagnosis problem and lays the groundwork for other organizational, contextual, intra- and interpersonal variables which may contribute to the creation of social and/or technical complexities beyond those apparent from a diagnosis of the task alone. To the extent possible, these influences will be used to indicate a broader approach to the

assessment of group performance problems, and to the future selection of group intervention strategies based on this broader assessment.

Major Problems Encountered

No major problems have been encountered this quarter which would interfere with the completion of this project.

Amount of Funds Expended

An unofficial estimate of funds expended to date shows that approximately $12,620.00 was spent on salaries and wages (excluding associated overhead and retirement), $525.59 was spent on travel, and approximately $170.00 on materials and supplies. The remaining funds are sufficient for the completion of the first year activities.

Pilot Tests of the Utility of a Task Typology for Diagnosing Process Difficulties Inherent in Group Tasks

Interim Report

Contract No. MDA903-80-C-0158

by

David M. Herold
College of Management
Georgia Institute of Technology
Atlanta, GA 30332

15 December 1980

Testing the Utility of the Task Typology

The purpose of the task typology was to describe tasks in terms of a limited number of dimensions related to the behavioral requirements or demands which they impose on groups. It is anticipated that an understanding of the general behavioral or process demands placed on the groups (i.e., predominantly social demands, technical demands, neither, or both) will permit a more directed diagnosis of where groups seem to be experiencing difficulties in achieving task success, as well as providing a guide for the type of assistance or intervention which has the greatest potential to aid the group. Furthermore, it is expected that the specific task attributes and sub-attributes which were defined for the purpose of identifying levels of social and technical process demands will, in the future, provide additional direction for specifying appropriate intervention strategies. For example, knowledge that a group is likely to be experiencing technical process difficulties due to the "unprogrammability" of a task would suggest a different intervention strategy or strategies than knowledge that the group is having difficulty coordinating the resources diffused amongst the various members.

However, before this or any other typology can be said to be useful, certain empirical and/or non-empirical demonstration of reliability and/or validity need to take place. In an earlier paper (Herold, 1979), construct validity support was obtained for the framework by showing that previously contradictory findings regarding the effects of various intervention strategies could be reconciled via the present task diagnosis applied to the tasks used in the various studies. This demonstration, however, relied on

a more clinical assessment of technical and social complexities inherent in the tasks, i.e., the presently developed task attributes and sub-attributes were not used. Future research will further investigate the validity of the framework in the sense of its ability to make accurate predictions concerning the consequences of various intervention strategies applied to groups performing various tasks.

The present effort is more concerned with the reliability of the present typology; that is, can it be used by different people to arrive at essentially the same diagnoses of tasks? This is an essential prerequisite for demonstrating the utility of the task typology. If individuals do not understand the typology or its constructs, if they arrive at substantially different categorizations for identical tasks, then the framework will have been found to have little utility in helping people think about tasks which work groups perform, and in systematically thinking through the types of difficulties which these tasks will present to the groups. If, however, it can be shown that different individuals, when confronted with the same task description, situation, or stimulus, can arrive at essentially the same diagnoses of the types of process issues likely to predominate, then one may move on to ask the subsequent question concerning the uses to which such diagnoses may be put. Again, this part of the research asks whether the typology "makes sense" as a prerequisite for further applications, much like measurement reliability being a necessary but not sufficient step in demonstrating measurement validity.

For the present research this step is especially important for the following reasons. The a priori categorization of tasks represents an expectation that certain social and technical task difficulties will have to

be addressed by the group. Our task attributes are characteristics of tasks in kind, but they are also characteristics of a particular task, situation, and group of individuals in degree. That is, concepts such as resource diffusion, ego involvement, programmability, etc. are relative, and their exact meaning is only evident in relationship to some context. Our point is that a priori categorizations have their limitations in that an argument can usually be made as to whether one is looking at task characteristics, group characteristics, or , as is more likely, task-group-environment characteristics.

Ultimately, the social and technical complexities confronted by a particular group will be a function of what is to be done, who is to do it, and under what conditions? That is, member and setting characteristics are also sources of process demands facing work groups and will be dealt with in other phases of the present research. However, we have implicitly argued here that we can benefit from an analysis of tasks independently of other influences and that particular types of tasks tend to create particular types of demands regardless of the specific group or context. In essence, we are making an argument based on "variance explained" notions. Tasks, it is claimed here, offer the greatest explanatory power, or will account for the greatest portion of variance in group process difficulties. However, as one moves from trying to objectively order the task environment to attempting to understand a particular group performing a specific task, it may be useful to reanalyze the task using the additional setting-specific information which may influence the values which certain of the task attributes may take on.

This suggests that we be prepared for shifts or refinements in a priori task diagnoses as contextual richness is added to any given task. We may wish for some purposes to define and compare tasks independently of situations

and groups, and we may want, or need to reanalyze tasks in a specific setting.

The above reasoning would be best supported by a demonstration that across individuals, across work groups, and across organizations, similar tasks were viewed as creating similar process demands. On the other hand, if some or all of the tasks were categorized very differently across individuals then we would need to entertain two alternative hypothesis: either people did not understand the concepts involved and the differences in categorization represent random error, or, people understood the concepts, but in those settings or frames of reference which they placed the tasks, various non-task variables were perceived to operate so as to influence the final categorization. Obviously, this last explanation would counter the argument that task-type accounts for the largest proportion of variance in process demands.

Methodology

The data collection was accomplished in four separate waves or phases. To allow for some idiosyncracy in tasks or terminology, as well as capitalizing on the availability of certain samples, all phases were conducted using insurance company middle-level managers. In all, 110 managers representing all major departments and functions in over 35 U.S. and Canadian companies were used in the research. The overall sample consisted of 19% female managers and differed widely in ages, tenure, and job experience.

Phase one consisted of training 20 managers in the theoretical meaning of the task typology and in the task attributes which may be useful in

classifying tasks. These managers were then placed into groups of five and asked to identify group tasks which they were familiar with from their organizational experiences, and which the group members felt were representative of one or more cells in the typology. The purpose of this phase was to identify tasks which would serve as stimuli for future phases of the research and would have high face validity for future samples. This process yielded seven tasks representing only three of the four cells.

In phase two, 27 managers were again trained in the use of the typology and then asked to classify the seven tasks generated by the previous group. Afterwards, these managers were asked to generate new tasks in small group discussions.

Phase three consisted of presenting 30 managers with a new set of tasks generated by the previous group and through discussions with other insurance company personnel. Again, after training, these managers were asked to cagegorize each of the tasks.

Finally, phase four consisted of combining the tasks used for phases two and three and presenting them to a group of 33 managers for categorization. This was done following a slightly more elaborate training procedure (to be described below). Next, these managers were divided into groups of 5 and 6, asked to discuss the reasoning which went into each person's caregorization, and subsequent to this discussion each participant was asked to indicate whether they wished to change any of the original classifications.

The task lists used for the various phases of the research were extremely broad and varied greatly in the degree to which they could be open to interpretation or the degree to which subjects had to make certain assumptions about them. In fact, some "tasks" were so broad as to probably

represent missions or goals which could be sub-divided into multiple tasks. Thus, "allocating reserved parking spaces to certain managers" is a fairly unambiguous stimulus describing a possible task which may confront an individual or a group. On the other hand, "new product development" is an ambiguous stimulus which probably represents many tasks and/or sub-tasks. Furthermore, task descriptors were kept intentionally brief so as not to describe a scenario or setting, or particular participants, as it was felt that this would confound the effects attributable to the task with those attributable to the particular setting or participants.

As such, little or nothing was done to structure participants' perceptions of tasks, while a premium was placed on including the maximum range or breadth of tasks, as well as making sure that they were, in fact, realistic tasks to be found in the participants' "back home" settings. It was felt that these procedures would provide the best test of the generalizability of the diagnostic procedure across tasks; would provide the most severe test of the diagnostic procedures because participants had a minimum of common information (i.e., only a few words of description); and, would be most likely to identify any categorization problems which might occur for a given task or a whole category of tasks. No attempt was made to balance stimulus tasks over the four cells of the typology. The task lists were restricted to those tasks generated by groups of participants, and thus thought to be an adequate representations of the task environment faced by these participants.

Results

Being that the purpose of this research was to pilot and refine a task diagnostic tool or procedure, the "results" of the various phases were

considered to consist of the actual categorizations of tasks as well as more qualitative and intuitive data generated by observation and debriefing which allowed for various procedural and content changes to be made in the sense of "fine tuning." In this section we shall describe both types of results by phases.

Phase 1. For this phase the task attributes used to define levels of social and technical complexity of tasks were as follows: for social complexity -- ego involvement, agreement on ends, and agreement on means; for technical complexity -- programmability (further classified by its sub-attributes of novelty, existence of routines, analyzability of procedures, solution multiplicity, and response verifiability), difficulty in terms of resource sophistication, and resource diffusion.

Participants were instructed to consider a task socially complex only if they determined that ego involvement was substantial and agreement was lacking on ends, means, or both. Participants were instructed to categorize tasks as technically complex if they were either unprogrammable, were difficult in that they required specialized or sophisticated skills, or required the bringing together of diffuse skills or services. These concepts were presented in a lecture format, with sufficient opportunities for questions and clarifications. Since this phase was only intended to generate task descriptors, the only "findings" were: a) that individuals and groups had little apparent difficulty in understanding and applying the concepts of the typology, b) starting from scratch, groups had a little difficulty generating tasks (only seven were generated by four groups) and seemed to spend most of their time on the more novel process of debating each task, and c) six of the seven tasks were socially complex. A possible explanation for

the last finding is that the training sensitized participants to that aspect of problems and created a mental set responsible for generating those types of tasks (the tasks generated are shown in Table 1).

Phase 2. This phase used the same attributes and training format as Phase 1. Table 1 reports the seven tasks generated by Phase 1 and how these were categorized in this phase. Five of the seven tasks show extremely high interrater reliability, with two tasks (moving the steno pool and filing with the state for new insurance products) being classified across two adjoining cells. For these two tasks all participants agreed on the diagnosis as to one of the typology dimensions, but there was disagreement as to classification on the second typology dimension. Defriefing of participants revealed that in the case of the state filing task, non-task variables such as the complexity of regulations in the participants' state influenced the degree of technical complexity which individuals perceived to be associated with the task. However, all subjects agreed that this task was socially simple. In the case of the steno pool relocation, while almost all subjects agreed that the task was socially complex, there was some disagreement as to whether technically the task was simple or complex.

From this phase it was learned that for many tasks in actual organizational settings individuals could be trained to use the theoretical framework to classify tasks by the potential social and technical difficulties which they present to the group, and that such classifications are quite reliable, i.e., tasks can be analyzed independently of other personal or contextual influences. It was also learned that while these judgements were quite easy to make (after training) for most tasks, for some tasks there remained some ambiguity as to their appropriate classification. This phase also generated

Task	Socially Complex-Technically Simple	Socially Complex-Technically Complex	Socially Simple-Technically Simple	Socially Simple-Technically Complex	Total
1. Changing company's name and/or logo.	1	24	-	2	27
2. Allocating reserved parking spaces.	26	1	-	-	27
3. Filing with state for approval of new policy.	-	-	11	16	27
4. Moving steno pool to new location.	18	7	2	-	27
5. Changing formula for computing agents' compensation.	1	25	-	1	27
6. Finding remedy for coffee-break abuse.	21	4	2	-	27
7. Deciding on the suspension of sale of "debit" or "industrial" insurance.	1	25	-	1	27

Table 1. Frequencies with which tasks in Figure 1 were classified into the cells in the typology by a second group of insurance-company managers.

new tasks to be used for the subsequent phase.

Phase 3. This phase used essentially the same procedures as Phase 2, except that individuals were asked to apply the diagnostic framework to different tasks. There were three purposes for doing this: a) to more fully test two cells in the task typology which were inadequately represented by the seven tasks used in the first test, b) to see whether managers could identify social and technical complexities inherent in a broad sampling of organizational tasks, and c) to gain additional insights into the non-task factors (i.e., membership or contextual) which would cause some individuals to perceive the same brief task descriptors as more or less socially or technically complex than others.

Using group tasks suggested by the previous sample of 27 insurance company managers, as well as some tasks identified by the investigator based on informal discussions with others and his knowledge of the industry, 12 new tasks were presented to a new sample of 30 managers for categorization. As before, these managers were briefly trained in the use of the task typology and in the task attributes which may be useful in determining the technical and/or social complexity inherent in a given task. Table 2 provides the description of each task and the frequency with which it was categorized in each of the typology cells by the 30 managers.

As was the case in the Phase 2, most of the tasks (8 of 12) showed very good interrater agreement, with an average of 81% of the managers agreeing on the diagnosis of these eight tasks. The remaining four tasks were again split between two adjoining cells, indicating wide agreement as to the classification of the tasks on one of the two dimensions but disagreement as to classification on the other dimension. For task number 3, filing

Task	Socially Complex-Technically Simple	Socially Complex-Technically Complex	Socially Simple-Technically Simple	Socially Simple Technically Complex	Total
1. Generating or modifying a vacation plan.	24	5	1	-	30
2. Designing new agent's contract.	3	24	1	2	30
3. Filing corporate tax returns.	-	3	8	19	30
4. New product development (including marketing, actuarial, and legal work).	-	26	-	4	30
5. Developing a work measurement system.	3	24	2	1	30
6. Planning for the disposal of old equipment.	2	2	26	-	30
7. Choosing a "software" package.	3	24	1	2	30
8. Enacting downward job-level changes based on a job reevaluation.	16	14	-	-	30
9. Developing a variable work-hours plan.	10	19	-	1	30
10. Choosing who goes to a LOMA seminar.	23	3	4	-	30
11. Deciding on changes in the mortgage loan discount policy for employees.	14	10	5	1	30
12. Establishing reserve rates.	-	4	4	22	30

Table 2. Task descriptors and their categorization by insurance company managers. Dominant cell or cells are underlined to show relative presence or absence of cross-classifications.

corporate tax returns, we find 90% of the managers (27 out of 30) agreeing that the task is socially simple, however, these people were split 27% and 63% as to whether the task was technically simple or complex. For the other 3 cross-classified tasks we find agreement that they are socially complex, however, different managers read a different degree of technical complexity into them.

At this point it became clear that in both Phases 2 and 3, when disagreement occurred, it was over the technical complexity of the task and not over the social complexity. Debriefing of subjects tended to indicate that social complexity could be correctly inferred even when individuals lacked personal experience with the task. That is, judgements as to whether ego involvement existed, and as to whether any group were likely to agree on means and/or ends seemed to be fairly easy to make. Perhaps people did so by placing themselves in the particular situation or generalizing from their experience in similar situations. However, inferring technical complexity seemed to require knowledge of the task which may not have been widely available. As a matter of fact, the attributes used for diagnosing technical complexity are such that some knowledge of the task would be required for correct assessment. For example, whether the task is programmable, the types of resources required, etc. can not be decided by simply putting one's self in that situation. To the degree that we were using a heterogeneous set of tasks with a hetergeneous subject population, we seem to have stacked the cards against the typology by asking people with little or no familiarity with some of the tasks to still diagnose them. It is interesting and encouraging that this did not create more problems than it did, and suggest that task familiarity may need to exist for proper

diagnosis of technical demands of tasks.

This Phase was useful in several respects. First is expanded our demonstration that individuals can be briefly trained in recognizing social and technical dilemmas inherent in tasks which they and their work groups confront. Second, it again showed that for a large percentage of organizational tasks (approximately 70%) the perceptions of these dilemmas remain constant across organizational contexts or situations, as evidenced by the agreement on their classification on the part of individuals coming from different companies and different departments within these companies. Third, it raised the question as to whether the cause of misclassifications is the lack of additional information concerning the task, or whether it is due to the unfamiliarity of some subjects with those tasks.

Finally, this phase identified a problem with the technical task diagnostic attributes which sometimes created a contradiction between the clinical judgement one would make as to the classification of a task, and that classification resulting from a strict adherence to the task attributes. It will be recalled that for Phases 1-3 technical complexity was diagnosed or defined by the following attributes: programmability (and its associated sub-attributes), difficulty in terms of resource sophistication, and resource diffusion. If one took a technically innocuous task, e.g., the allocation of reserved parking spaces, and strictly applied these task attributes one could conclude that it is an unprogrammable task (assuming that no policy such as "seniority" existed to "program" it). This would lead to its categorization as "technically complex," when, in fact, intuition, clinical assessments, and actual experience would tell one that it is "technically simple" (which is how 26 of 27 subjects classified it).

These problems led to another important outcome of Phse 3, namely, a reconsideration of the task attributes to be used for diagnosis of technical complexity, and the decision to attempt a more structured adherence to diagnostic attributes so as to "force" subjects to "go through" these attributes when making their judgements. These developments are described below under Phase 4 developments.

Phase 4. As noted above, for this phase both the technical task diagnostic attributes and the mode of presentation were modified. For dealing with the technical attributes issue the concept of technical "quality" was introduced based on earlier work by Maier (1963), Vroom (1969), and Vroom and Yetton (1973) in the areas of leadership and decision-making. The "quality" attribute asks whether or not solution "quality" (in the technical sense) is an issue or even a relevant consideration. The concept has to do with the existence (or lack) of objectives or criteria which will be differentially satisfied by different outcomes. It is also related to the organization's or leader's degree of indifference to various group outcomes.

Thus, if one were to ask whether "quality" is an issue for the reserved parking spaces problem, one would conclude that there is no way of judging which is a "better" solution depending upon who did or did not get the spaces, and more than likely, the organization is indifferent as to who occupies them; therefore, for this task there is no quality issue and the consideration of the subsequent attributes for technical complexity becomes irrelevant. On the other hand, for a task such as "choosing a software package" quality issues are very relevant. Organizational and departmental objectives (e.g., cost, capabilities, etc.) have to be served by the new package, some packages will serve these objectives better than others, the organization

and the group leader are not indifferent as to the ultimate outcome. Knowing this, it now makes more sense to ask whether the task is programmable or not, and where the relevant resources reside.

Quality can also be said not to be an issue where it is a relevant dimension (i.e., can be assessed) but where satisfying it is so obvious or mundane that one need not really consider it as creating problems or technical complexities. Thus, if one were scheduling coffee breaks or lunch breaks certainly a decision to let everyone in a large organization go at the same time, thus leaving important jobs uncovered and overtaxing facilities, could be considered a "low quality" decision. However, the likelihood of this occurring, or of groups or individuals not meeting these quality constraints seems so low that for all practical purposes we may say that technical quality is not an issue for this task.

Another modification was made in the use of the resource sophistication and diffusion attributes. Originally, resource sophistication was included to denote complex skill or resource requirements which may or may not be present in the group, while resource diffusion was included to reflect the dispersion of skills and resources within the group. These two notions were slightly redefined to explicate their presentation and clarify their meaning. Both attributes were subsumed under one attribute or question called "resource centralization" with this attribute being split into two sub-attributes -- "resource adequacy" reflecting whether the necessary resources are likely to reside in the group, and "resource diffusion" reflecting the diffusion of the necessary skills and resources <u>within</u> the group.

This process left us with three diagnostic attributes or questions for determining technical complexity. "Is quality an issue"? "Is the task

programmable?" "Are the resources necessary centralized?" Next, to place greater structure on the diagnostic process, these attributes were arranged in a decision-tree format as follows: a) if quality is not an issue the subsequent questions are irrelevant and the task is technically simple; b) if quality is an issue, but the task is programmable and the necessary resources are centralized in one or a few group members, the task again does not present the group with any substantial technical problems; c) if quality is important, and the problem is either unprogrammable, and/or the requisite resources are either not in the group or spread out within the group, then the group confronts non-trivial technical problems in generating a product. Figure 4, illustrates this decision tree.

The task attributes for diagnosing social complexity proved satisfactory throughout Phases 1-3 and were retained. However, these too were structured into a decision tree to facilitate diagnosis. If ego involvement was low or not an issue, the task is said to be socially simple whether or not agreement over ends and/or means exists. If ego involvement is an issue but agreement on ends and means exists, the task still will not create social problems for the group. If ego involvement is an issue and there is likely to be disagreement over ends and/or means, the group faces a socially complex task. These decisions rules are illustrated in Figure 5.

With these theoretical and procedural changes accomplished, Phase 4 consisted of combining the tasks from Phases 2 and 3 and asking participants to diagnose these tasks by going through the decision tree for each task, after they had received training in the theoretical meaning of the typology, the task-diagnostic attributes, as well as the sub-attributes for the attributes of "programmability" and "resource centralization." After

Figure 4. DETERMINING THE TECHNICAL COMPLEXITY OF GROUP TASKS

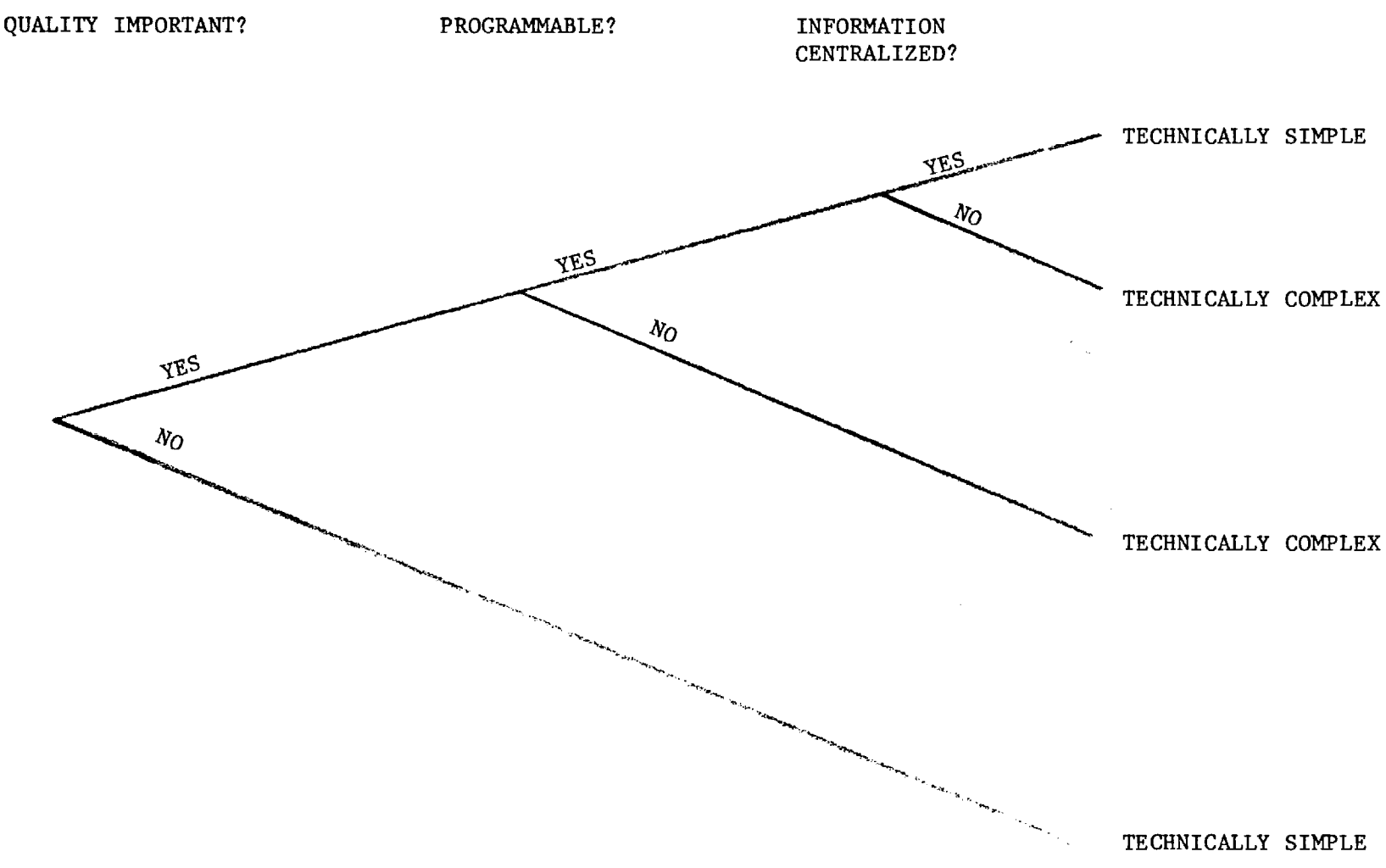
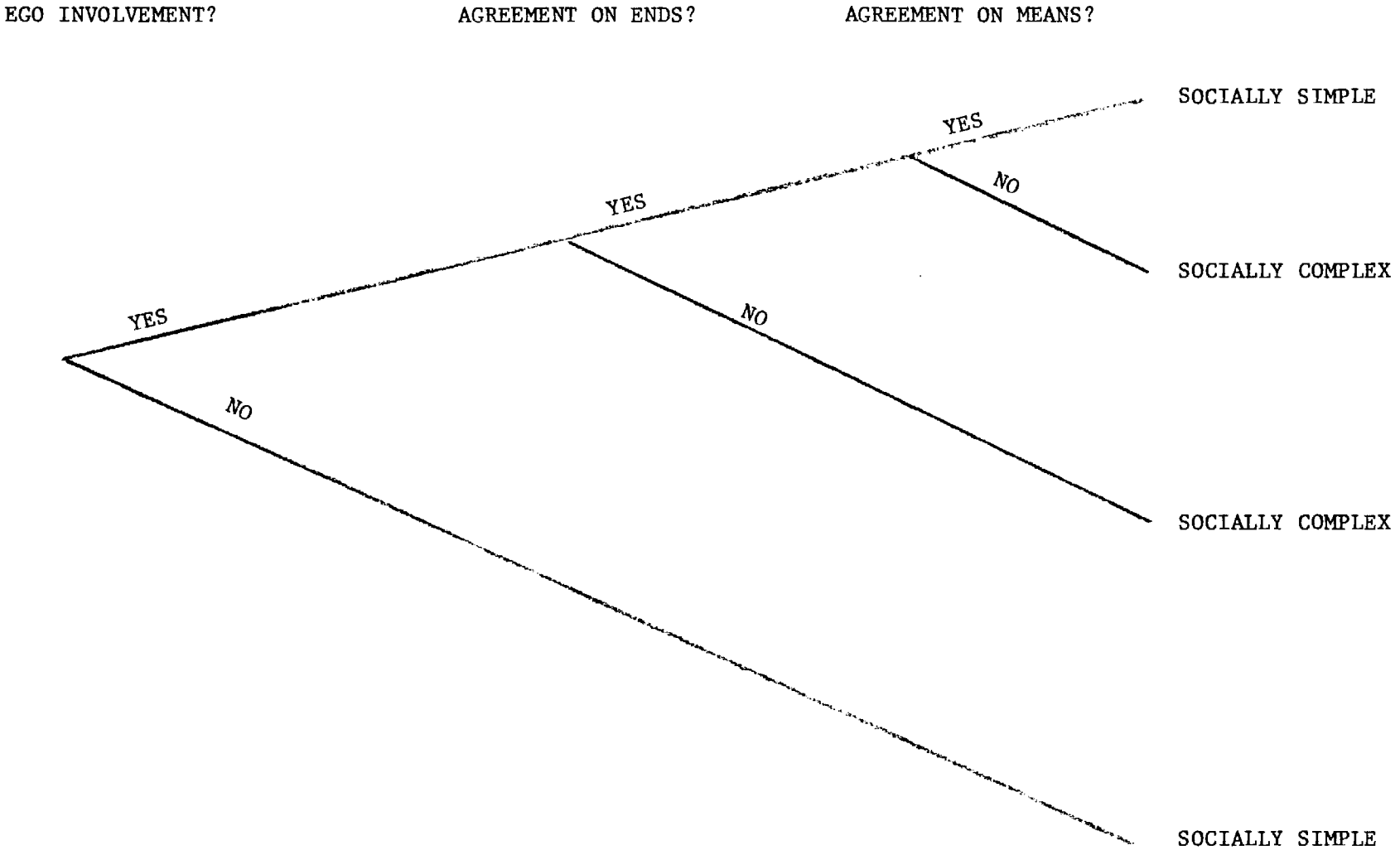


Figure 5. DETERMINING THE SOCIAL COMPLEXITY OF GROUP TASKS



diagnosing each task, participants were split into groups of 5 and 6 and aksed to discuss each task's classification and why particular participants saw it the way they did. After these discussions all participants were asked to indicate whther they wished to change any of their classifications. This latter process, new to Phase 4, was intended to shed light on the hypothesis that lack of familiarity creates some of the classification disagreements we have been finding. Table 3 presents the results of this classification before and after group discussions.

It should be noted that statistical tests are not appropriate for these data. Tests of association such as Chi^2 are inappropriate because we are not testing for the correlation of the two classificatory dimensions. Tests of deviation from some distribution of observations also are not appropriate because we don't know what the distribution would be given no training in classifying tasks. Therefore, we need to look at these data as interrater agreement data, and consider only the degree of agreement we have with some a priori, or theoretically correct "model". For that purpose the following rule of thumb was used in interpreting the data in Table 3. If 2/3 (67%) of the raters agreed on the classification of a particular task, we may say that interrater agreement is substantial and that particular cell or classification is dominant (underline in Table 3).

Using this interpretation we see that before group discussion 12 of 20 tasks (60%) had a dominant classification (compared to 71% and 67% for Phases 2 and 3, respectively. using sub-sets of these tasks), while after group discussion this ratio changed to 17/20 or 85%. This improvement lends some support to the interpretation that group discussion allowed participants to enhance their familiarity with the task if they had no personal experience

Task	Socially Complex-Technically Simple	Socially Complex-Technically Complex	Socially Simple Technically Simple	Socially Simple Technically Complex
1. Changing company's name and/or logo.	12 (8)	9 (17)	2 (1)	10 (7)
2. Allocating reserved parking spaces.	31 (31)	0 (1)	1 (1)	1 (0)
3. Filing with state for approval of new policy.	0 (0)	2 (0)	3 (1)	28 (32)
4. Moving steno pool to new location.	23 (27)	8 (6)	2 (0)	0 (0)
5. Changing formula for computing agents' compensation.	7 (6)	20 (24)	0 (0)	6 (3)
6. Finding remedy for coffee-break abuse.	24 (28)	5 (3)	4 (2)	0 (0)
7. Deciding on the suspension of sale of "debit" or "industrial" insurance.	3 (1)	16 (25)	0 (0)	14 (7)
8. Generating or modifying a vacation plan.	18 (22)	10 (8)	5 (3)	0 (0)
9. Designing new agent's contract.	4 (4)	23 (26)	2 (0)	4 (3)
10. Updating an administrative manual.	1 (3)	9 (7)	9 (6)	14 (17)
11. Filing corporate tax returns.	0 (0)	1 (1)	10 (3)	22 (29)
12. New product development (including marketing, actuarial, and legal work).	0 (0)	26 (31)	0 (0)	7 (2)
13. Developing a work measurement system.	5 (2)	28 (31)	0 (0)	0 (0)
14. Planning for the disposal of old equipment.	3 (3)	1 (0)	24 (27)	5 (3)
15. Choosing a "software" package.	2 (1)	27 (32)	0 (0)	4 (0)
16. Enacting downward job-level changes based on a job reevaluation.	16 (15)	17 (18)	0 (0)	0 (0)
17. Developing a variable work-hours plan.	15 (22)	14 (8)	2 (3)	2 (0)
18. Choosing who goes to a LOMA seminar.	23 (28)	2 (0)	8 (5)	0 (0)
19. Deciding on changes in the mortgage loan discount policy for employees.	17 (28)	8 (2)	4 (1)	4 (2)
20. Establishing reserve rates.	1 (0)	1 (1)	7 (8)	24 (24)

Table 3. Task descriptors and their categorizations by insurance company managers before and (after) group discussion. Dominant cell (if any) is underlined (task #10 was inadvertantly left out of Phase 3).

with it. In fact, of the 1320 judgments to be made (20 tasks x 33 people x 2 dimensions), group discussion led to 139 changes in individual choices, of which 121 or 87% were in the "correct" direction, i.e., consistent with a theoretical explanation of the type of task being analyzed.

Further looking at the hypothesis generated in Phase 3, that lack of familiarity creates more problems for technical complexity diagnoses than for social complexity diagnoses, we find that in four of the five tasks for which group discussion created a dominant cell where none existed before (tasks 5, 8, 17, and 19), there existed the required agreement or social complexity before the discussion and group discussion was apparently used to solidify technical complexity diagnoses. Only for task #7 do we find agreement on technical complexity but not on social complexity before discussion, with an apparent resolution of the social issue through group discussion. Finally, of the 139 changes in individual choices which took place subsequent to group discussion, 89 or 64% were changes in individuals' diagnoses of the technical complexity of tasks.

Lastly, we rate from Table 3 that three tasks remain with substantial disagreement even after group discussion (Tasks 1, 10, and 16). Interestingly again, the necessary 2/3 agreement exists on the social complexity of all three tasks, but disagreement still exists for the technical dimension.

Conclusions

What did we learn from these phases? Empirically, we learned that the present typology can be used for diagnosing a wide variety of tasks. Interrater agreement on task classifications are quite high for most of the tasks, ranging as high as 94% for some tasks. Furthermore, we learned that

using brief descriptors of a wide variety of tasks from a variety of contexts creates a dilemma in task diagnosis due to lack of familiarity. This problem is unique to the research design and would not occur in applications of this procedure in actual organizational settings, where one could expect individuals to be more familiar with the range of tasks which they are likely to confront. We also learned that the major diagnosis problems occur for the technical dimension, and that group discusssions substantially improved interrater agreement.

Clinically or qualitatively we also learned a few things. First, the restructuring of the task attributes and their use as decision trees created a useful diagnostic and pedagogical tool. Training was simplified and transfer of learning from the training to the actual diagnosis of tasks seemed improved. In that respect we have accomplished what we set out to do for this part of the research.

We also learned that extremely brief task descriptors were sufficient to act as stimuli for categorization, indicating that many tasks are viewed as representing the same demands across a wide variety of organizations and organizational settings. Given that we had heterogeneous samples of managers, as well as heterogeneous task sets, this outcome is reassuring. That is, while it may be true that environmental and member characteristics will influence the ultimate technical and social demands confronted by groups (as we discussed earlier), these findings indicate that in many cases a task is a task, is a task; additional information is not necessarily important to predict the type of issues (technical, social, or both) which the group is likely to confront.

For other tasks this was not the case, and we found that diagnosis

suffered. There are four possible explanations for this: a) the task descriptors were too brief to communicate enough information necessary to make a judgment; b) the task descriptors represented generic categories of tasks rather than specific tasks, and therefore, individuals may have been responding to different tasks within the category (this is especially true of tasks 1, 10, and 16 where no agreement was reached); c) participants lacked sufficient knowledge of some tasks to engage in an accurate diagnosis; or d) some tasks do not lend themselves to this process because their final categorization depends more on the characteristics of the situation and group membership than on characteristics of the task itself, i.e., the same task may be socially and technically simple or complex depending upon the setting.

These limitations are not considered problematical. The first three should disappear when these procedures are applied in field settings where participants are familiar with the task and where a given task represents a given stimulus complex to all or most people. The last issue is precisely why we have argued that future work will need to consider non-task influences on social and technical process demands.

Given these limitations, and our earlier discussions of the variance to be explained using knowledge of tasks alone, and the need to demonstrate the reliability of the present typology, these data offer strong support for the task typology approach advocated here as a means of predicting technical and social process difficulties likely to be encountered by work groups.

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